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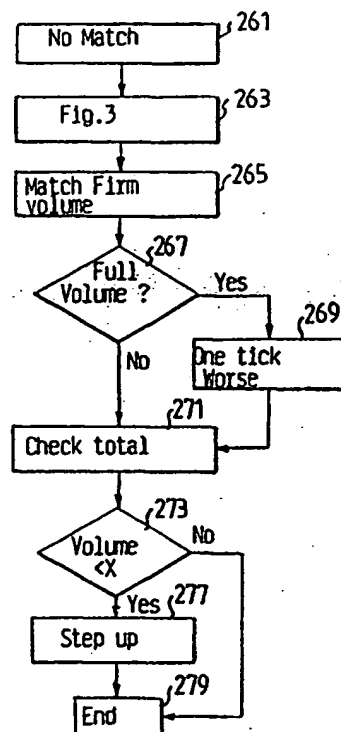
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(21) International Application Number: PCT/SE99/01994 (22) International Filing Date: 4 November 1999 (04.11.99) (30) Priority Data: 09/186,154                      5 November 1998 (05.11.98)      US (71) Applicant: OM TECHNOLOGY AB [SE/SE]; S-105 78 Stockholm (SE). (72) Inventors: TILFORS, Jan; Jung Atles väg 12, S-167 74 Stockholm (SE). KATZ, Gary; 3 Warren Place, Plainview, NY 11803 (US). (74) Agents: SANDSTRÖM, Staffan et al.; Bergenstråhle & Lindvall AB, Box 17704, S-118 93 Stockholm (SE).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  Published Without international search report and to be republished upon receipt of that report.	

(54) Title: AN AUTOMATED EXCHANGE SYSTEM

(57) Abstract

In an automated exchange system means are provided by means of which a market maker can enter a course of action in advance, so that the volume in the orderbook is continuously updated, and where the updating is performed differently with respect to different counterparts. Also, quotes that may result in a trade between Market Makers are hidden for some time before being matched, thus giving the Market Makers a chance to back off. The system employs a function that supports that Market Makers through pre-defined parameters will have new orders generated by the system and that a market maker can act differently with respect to different counterparts. The parameters specify if a Market Maker should add extra volume on an existing price or generate a new order at a worse price. In order to make it possible for market makers to have a very tight spread without forcing them to take larger risks, additional logic is used when matching orders. The algorithm used for this purpose protects the market makers in certain situations and gives market makers the possibility to have a tight spread without taking a large risk. The algorithm also supports that the market makers can take the risk to quote large volumes.



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Thus, if the prices on the market starts to change, the market maker has a buffer in that he has entered a large spread, and he will thus have more time to correct his prices.

However, as pointed out above, it is in the exchange interest to have as tight spread as possible between the best bid and the best offer in order to attract investors. Therefore, it is desired that the spread is smaller than it is today, without forcing the market makers to take the risk of making undesired matches.

Furthermore, today's automated exchange systems does not support that market makers act differently with respects to different counterparts or types of counterparts.

#### SUMMARY

It is an object of the present invention to overcome the problems as outlined above and to provide an automated exchange system having functionality which makes it possible for market makers to act differently with respect to different counterparts and which therefore can cope with situations where matching bids should not be matched, and thereby making it possible for market makers to enter two way quotes having a very small spread without taking the risk of making undesired matches.

This object and others are obtained by a method and a system wherein a market maker can enter a course of action in advance, so that the volume in the orderbook is continuously updated, and where the updating is performed differently with respect to different counter parts. Also, quotes that may result in a trade between Market Makers are hidden for some time before being matched, thus giving the Market Makers a chance to back off.

Thus, the system employs a function that supports that Market Makers through pre-defined parameters will have new orders automatically generated by the system and that a market maker can act differently with respect to different counterparts. The parameters specify if a Market Maker should add extra volume on an existing price or generate a new order at a worse price.

Thus, in order to support market makers to have a very tight spread additional logic is used when matching orders. The algorithm used for this purpose protects the market makers in certain situations and gives market makers the possibility to have a tight spread without taking a large risk. The algorithm also supports that the market makers can take the risk to quote large volumes.

The algorithm uses a set of parameters, which are predefined by each market maker. The parameters are for example:

- Firm limit parameter, which restricts how much of a quote may be traded against a Firm order or a market maker order/quote.
- Step-up buffer parameter, which is used for determining when to increase the volume on the market.
- Tick worse volume parameter, which is used for automatically placing new quotes on the market.

The algorithm is executed when a market maker participates in a trade. In a preferred embodiment there are three different methods in the algorithm depending on the counterpart in the trade:

Thus, when the counterpart is a customer the market maker participates in the trade with the full volume.

If the market maker full volume at the best price is traded, and the customer order indicates that it want to trade more (volume and price indicates further matching) the tick worse parameter generates new quotes in accordance with an algorithm described below.

When the trade is executed a check is done of the total volume at the best bid/offer. If the volume is less than X, which is a parameter predefined by the exchange, the step-up parameter is used to automatically generate more volume in the market makers existing quote. If the parameter indicates to not generate more

volume the tick one worse parameter instead generates new quotes.

When the counterpart is a firm the market maker participates in the trade with the firm volume. This supports that the market maker can have reduced volume (risk) when trading with firms.

If the market maker firm volume at the best price is traded, and the firm order indicates that it want to trade more (volume and price indicates further matching) the tick one worse parameter generates new quotes.

When the trade is executed a check is done of the total volume at the best bid/offer. If the volume is less than X, which is parameter predefined by the exchange, the step-up parameter is used to automatically generate more volume in the market makers existing quote. If the parameter indicates to not generate more volume the tick one worse parameter instead generates new quotes.

When the counterpart is a market maker no match take place. Instead the incoming order is inserted into the order book but no update of the best bid offer is sent out, i.e. now there are quotes in the order book crossing but it is not sent out in the best bid/offer. After a time Y, which is predefined by the exchange, the algorithm checks if there still is a lock, i.e. matching prices, in the order book, and if so the orders are matched.

If the counterpart is another market maker, the market maker participates in the trade with the firm volume. This supports that market makers do not take the risk to trade with other market makers just because they are a bit slow to send in new quotes. This also supports that the market maker can have reduced volume (risk) when trading with other market makers.

If the market maker full volume at the best price is traded, and the opposite market maker quote indicates that it want to trade more (volume and price indicates further matching) the one tick

worse parameter generates new quotes.

The method and system as described herein makes it possible for a market maker to act differently with respect to different counterparts. This makes the risks which the market maker has to take lower, and therefore the market maker can reduce the spread, which in turn will increase the attraction on investors.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described by way of non-limiting examples and with reference to the accompanying drawings, in which:

- Fig. 1 is a flow chart illustrating the basic steps carried out in an automated exchange system.
- Figs. 2a - c are flow charts illustrating some of the steps carried out when matching two bids in an automated exchange system for different types of counterparts.
- Fig. 3 is a flow chart illustrating steps carried out in a matching procedure between two market makers.
- Fig. 4 is a flow chart illustrating different steps carried out when executing the one tick worse rule.

#### DESCRIPTION OF PREFERRED EMBODIMENTS

In the following description, being given as an example only, the following definitions will be used:

- A market maker is defined to be a market maker for certain financial instruments.
- When a market maker sends in a prices to the order book in instruments where he is a market maker the prices are sent in as quotes. Quotes are always limit order that will be stored in the book if not matched.
- Quotes can only be used by market maker members in instruments where they are defined as market makers.
- When a market maker trades in series (instruments) where he not is defined as a market maker he is, in the examples given below, considered to be a firm. He can then only send in orders. Furthermore, the system as described below is assumed to have the following characteristics:

If the market maker full volume at the best price is traded, and the customer order indicates that it want to trade more (volume and price indicates further matching), step 203, the one-tick-worse rule as described below is executed, step 205, and else the procedure proceeds directly to a step 207.

When the trade is executed a check is done of the total volume in the orderbook at the best bid/offer, step 207. If the total volume in the orderbook is found to be less than X, in step a 209, where X is a predefined parameter by the exchange, the step-up parameter, as described below, is used to automatically generate more volume in the market makers existing quote, step 211. If the parameter indicates to not generate more volume the procedure proceeds directly to a step 215. Finally, the matching procedure ends in a step 215.

However, in a preferred embodiment, the step 211 can be executed in the following manner (not shown). If the total volume is only a little smaller than the volume required by the exchange, the step up parameter is used to automatically generate more volume at the current price. If, on the other hand, a larger volume needs to be generated in order to obtain the volume X, the one tick worse parameter is used to generate the requested volume at a worse price. Also, if in the step 211, the step up parameter has been used to generate more volume a number of consecutive times at the same price, the one tick worse parameter can be used, even though the step-up parameter normally should have been used. This will prevent that a customer enters a large number of small orders and that the system then generates more volume at the current price instead of offering a worse price as would have been the case if the customer had entered one large order.

In Fig. 2b, the procedure when matching between a selling market maker and a buying firm is illustrated. When the counterpart is a firm the matching always take place as is indicated in step 231. However, the market maker participates in the trade with a firm volume, usually being smaller than the full volume and which can be set by the market maker in the system. This

Next, in a step 267, it is checked if the market maker firm volume at the best price is traded, and the opposite market maker quote indicates that it wants to trade more, i.e. volume and price indicates further matching. If this is the case, the one-tick-worse rule as described below is executed, step 269.

When the trade is executed a check is done of the total volume at the best bid/offer, step 271. If the volume is found to be less than X, in step a 273, where X is a predefined parameter by the exchange, the step-up parameter, as described below is used to automatically generate more volume in the market makers existing quote, step 277. If the parameter indicates to not generate more volume the procedure proceeds directly to a step 279. Finally, the matching procedure ends in the step 279.

However, the step 277 can also be executed as described above in conjunction with step 211.

In Fig. 3, a procedure for executing an algorithm for matching prices between two market makers is shown. The algorithm as shown in Fig. 3 can for example be used when executing the step 263 as described above. Thus, first in a step 301 the buy price is received. Next, the sell price is received, step 303. Thereupon it is checked if there are matching orders, step 305. If the outcome of step 305 is yes then wait a short time, e.g. 2 s, step 307, else the procedure proceeds to step 311.

When the short time has elapsed, the prices are updated, step 309. Thereupon, a new check is executed for checking if there are still matching prices, step 313. If this is not the case the procedure proceeds to step 311 where it is decided not to match, else the procedure proceeds to a step 315 where a match takes place.

In a preferred embodiment, if in the step 305 matching prices are established, the marker makers having the matching offers are marked, and a match only takes place if the same, marked marker makers still wants to trade in step 313.



The step up parameter is a parameter indicating that new volume at the same price should be generated if the total volume is below the minimum volume specified by the exchange. The step up parameter can also indicate that the one tick worse parameter should be used to generate new volume. This can for example be the case if there is a need for a large volume. The one tick worse parameter can also be used if the step up parameter has generated more volume at the same price for a predefined number of times.

The method and system as described herein makes it possible for a market maker to act differently with respect to different counterparts. This makes the risks which the market maker has to take lower, and therefore the market maker can reduce the spread, which in turn will increase the attraction on investors.

Thus, by using a function that supports that Market Makers through pre-defined parameters will have new orders generated by the system and that a market maker can act differently with respect to different counterparts. The parameters specify if a Market Maker should add extra volume on an existing price or generate a new order at a worse price. In order to make it possible for market makers to have a very tight spread without forcing them to take larger risks, additional logic is used when matching orders. The algorithm as described herein protects the market makers in certain situations and gives market makers the possibility to have a tight spread without taking a large risk. The algorithm also supports that the market makers can take the risk to quote large volumes.

## CLAIMS

1. An automated exchange system for matching bids between a buyer and a seller, and where the buyer or seller is a market maker, comprising:
  - means for executing the matching according to at least two different matching schemes in response to the counterpart of the market maker.
2. A system according to claim 1, wherein means are arranged to automatically generate more volume at a worse price, if all volume at a first price is traded in the matching.
3. A system according to any of claims 1 - 2, when both the buyer and the seller is a market maker comprising means for delaying the match during a predetermined period of time.
4. A system according to claim 3, further comprising means connected to the delay means for executing the match if the selling price and the buying price still indicate a match after the period of time has elapsed and to not match if the selling price and the buying price no longer match each other.
5. A system according to claim 1, wherein means are arranged to automatically generate more volume at the same price, if the volume traded in the matching results in that the remaining volume is less than a minimum volume specified by the exchange.
6. A method of matching bids between a buyer and a seller in an automated exchange system, where the buyer or seller is a market maker, comprising the steps of:
  - identifying the type of counterpart of the market maker, and
  - executing the matching according to at least two different matching schemes in response to the type counterpart of the market maker.
7. A method according to claim 6, wherein more volume at a worse price is generated , if all volume at a first price is traded in the matching.

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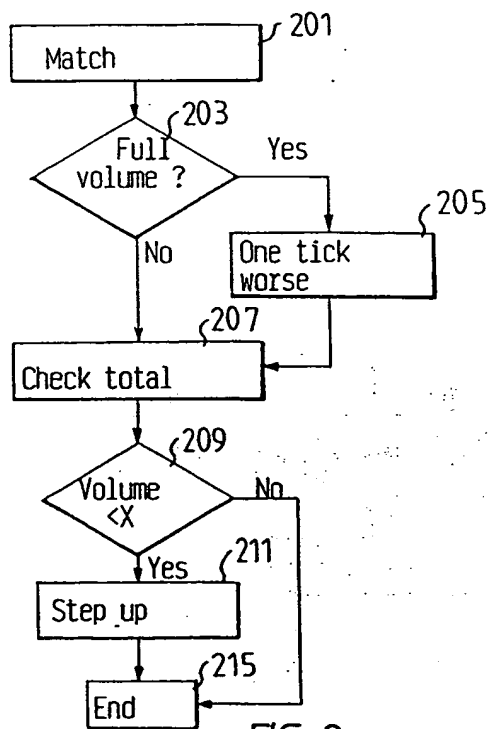
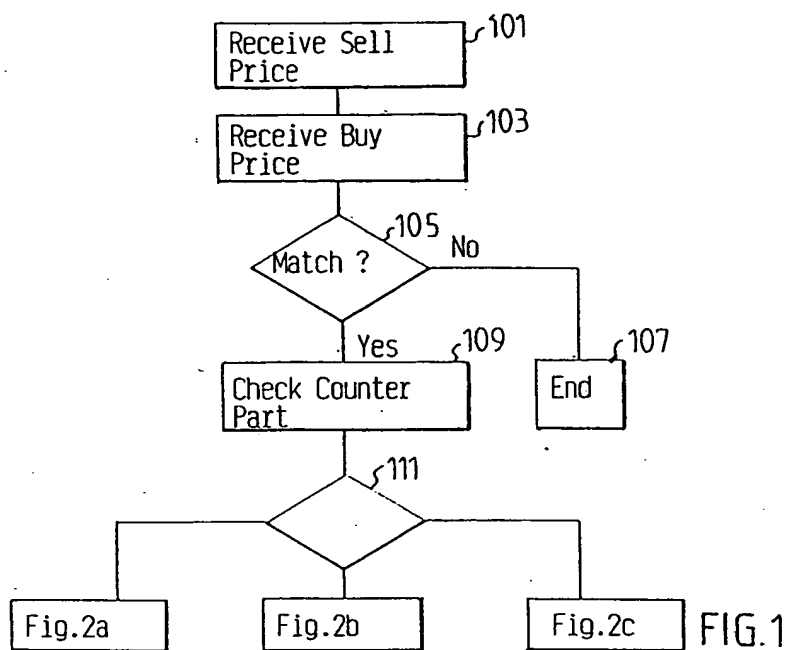


FIG. 2a

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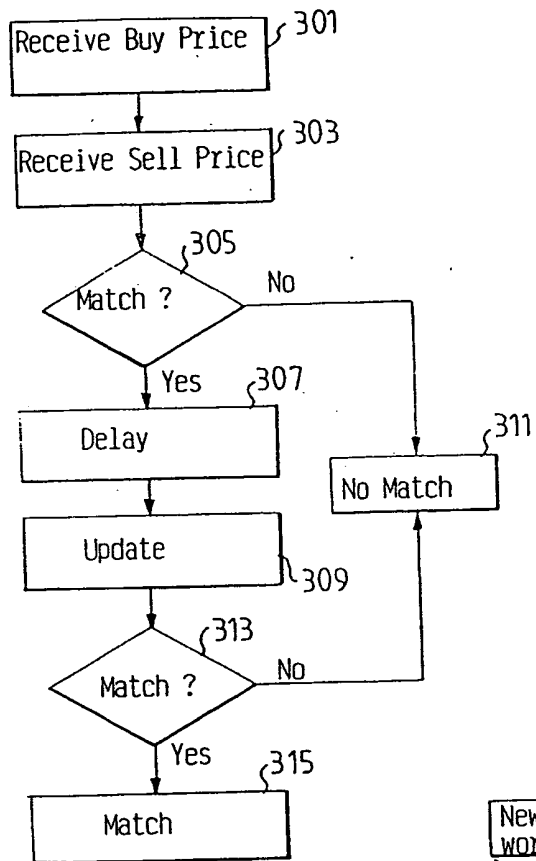


FIG. 3

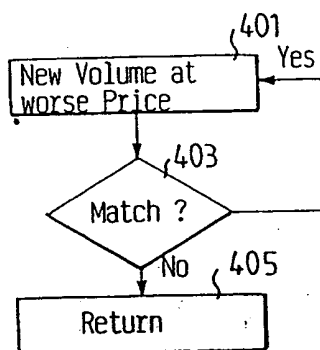


FIG. 4